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(54) Hydrophilically coated flexible wire guide.

(57) A wire guide comprising an elongate central core and a coil formed of radiopaque material which is positioned substantially concentrically with the elongate central core. The wire guide also comprises a polymer sleeve which encloses the elongated central core. The guide wire further comprises a hydrophilic coating which substantially encloses the polymer sleeve.

EP 0 405 823 A2

HYDROPHILICALLY COATED FLEXIBLE WIRE GUIDE

Background of the Invention

This invention relates to wire guides which may be used for placement of catheters.

One application for which such wire guides are used is the percutaneous placement of a catheter into the vascular system. The procedure involves penetrating an organ, such as a vein or the like, with a needle. The wire guide is then passed through the needle into the organ. The needle is then withdrawn over the wire guide, leaving the wire guide in place in the organ. A catheter is then slid over the wire guide into the organ and further guided by the wire guide through the organ. Such a wire guide can be used, for example, to position a catheter at difficult to reach locations in or around the heart or the like.

Wire guides have heretofore been provided to facilitate the insertion of a catheter into an organ, such as a vein, and further to facilitate the guidance of a catheter through an organ to various locations in a body. Certain prior art wire guides have a coil spring throughout its entire length of the guide and therefore are susceptible to breakage. In addition, use of some prior art wire guides create friction between the coils of the spring and the inner surface of the organ.

In order to overcome such problems, wire guides were developed having a plastic outside surface. Other wire guides have been developed including a hydrophilic coating on the outside surface in order to reduce friction between the outer surface of the wire guide and the inner surface of the organ and further to reduce the likelihood of breakage of the wire guide while in the organ. As regards prior art wire guides having a hydrophilic coating on their outside surface, such coating extends over the entire proximal portion of the wire guide making it difficult for the operator to grip and control the wire guide.

Summary of the Invention

One embodiment of the present invention might involve a wire guide which includes a elongated central core having a proximal and distal portion. There is provided a coil positioned substantially concentrically with the elongated central core and secured to the distal portion of the elongated central core. The coil includes a proximal and distal portion. There is further provided a polymer sleeve which encloses the proximal portion of the elongated central core. Moreover, a hydrophilic coating encloses the polymer sleeve. In another embodiment of the present invention the proximal portion of hydrophilic coating is positioned so as not to cover the extreme proximal portion of polymer sleeve.

One object of the invention is to provide an improved wire guide.

Another object of the invention is to provide a wire guide in which friction is reduced between the outer surface of the wire guide and the inner surface of the organ.

A further object of the invention is to provide a wire guide having a good base for a hydrophilic coating.

Still another object of the invention is to provide a wire guide which has an improved appearance and surface finish.

Another object of the invention is to provide a wire guide which is easier for the operator to grip and consequently easier for the operator to control.

Description of the drawings

FIG. 1 is a side elevational view partially in cross section of a wire guide incorporating the present invention.

FIG. 2 is a side elevational view partially in cross section of an alternative embodiment of the invention.

FIG. 3 is a cross-sectional view taken along the line 3-3 of both FIGS. 1 and 2.

Description of the Preferred Embodiment

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring now to FIGS. 1 and 3, there is illustrated a wire guide 10 which may have a diameter ranging from 0.012 to 0.065 inches and a length ranging from 20.0 to 460.0 centimeters. Wire guide 10 includes a flexible elongated central core 11

having a uniform thickness at its proximal portion 11a and tapered at its distal portion 11b. The length of the taper at distal portion of elongate central core 11b can vary from 1.0 to 30.0 centimeters, however, such taper length is typically 10.0 to 15.0 centimeters. The elongated central core 11 also includes a proximal end 11c and a distal end 11d. The central core 11 may be formed of any suitable metal, however, it is preferred to construct elongate central core 11 from a nickel titanium alloy such as Nitinol. When Nitinol is used, the diameter of the elongate central core 11 should be very near the diameter of wire guide 10. Nitinol does not have as great a stiffness or tensile strength as other materials such as stainless steel. Therefore, in order to overcome the resulting loss in stiffness, a much larger diameter Nitinol elongate central core is used.

The distal portion 11b of elongate central core is affixed to an elongate coil 14 at either its proximal portion 14a or its distal portion 14b or both. Such affixation may be achieved by welding, soldering or glue bonding. Elongate coil 14 may be made of platinum in order to give wire guide 10 extremely good radiopacity (better than stainless steel) and a soft, floppy distal portion. The coil 14 may range in length from 1.0 to 15.0 centimeters, however, its length is typically 2.0 to 3.0 centimeters.

Also affixed to distal portion of elongate central core 11b is a safety ribbon wire 15. The safety ribbon wire 15 may be made of a suitable material such as stainless steel. Safety ribbon wire 15 has a proximal portion 15a and a distal portion 15b. The safety ribbon wire 15 may be affixed to elongate central core 11 by welding, soldering or glue bonding the above two members together. One possibility is to affix the distal portion of elongate member 11b to the proximal portion of safety ribbon wire 15a.

A thin polymer sleeve 12 completely encloses proximal portion of elongate central core 11a and proximal end of elongate central core 11c. The resulting outer diameter of polymer sleeve 12 positioned on top of elongate central core 11 is substantially the same as the diameter of wire guide 10. Polymer sleeve 12 has a proximal portion 12a and a distal portion 12b. Distal portion of polymer sleeve 12b partially encloses distal portion of elongate central core 11b. In addition, distal portion of polymer sleeve 12b partially covers the proximal portion 14a of the coil and the proximal portion 15a of safety ribbon wire. Polymer sleeve 12 can be formed from any suitable material such as polyurethane.

The polymer sleeve 12 creates a good base for a hydrophilic coating 13 and gives wire guide 10 a good appearance and surface finish. The hydrophilic coating 13 includes a proximal portion 13a and a distal portion 13b. Proximal portion of hydrophilic coating 13a encloses proximal portion of polymer sleeve 12a, proximal portion of elongate central core 11a and proximal end of elongate central core 11c. The distal portion of hydrophilic coating 13b encloses distal portion of polymer sleeve 12b and partially encloses distal portion of elongate central core 11b. In addition, distal portion of hydrophilic coating 13b partially covers the proximal portion of the coil 14a and proximal portion of safety ribbon wire 15a. The hydrophilic coating 13 makes wire guide 10 extremely slick and allows it to be easily maneuvered through tortuous areas.

A rounded metallic protrusion 16 is disposed on the distal extremity of wire guide 10. The metallic protrusion 16 can be affixed to distal portion of safety ribbon wire 15b. Such protrusion is formed by a weld or solder.

Another embodiment of a wire guide incorporating the present invention is shown in FIG. 2 in which the wire guide 20 includes an elongated central core 21, a polymer sleeve 22, a hydrophilic coating 23, an elongated coil 24, a safety ribbon wire 25 and a rounded metallic protrusion 26. The alternate embodiment of the wire guide shown in FIG. 2 is identical to the embodiment of the wire guide shown in FIG. 1 in all respects except that in the embodiment shown in FIG. 2, the proximal portion of hydrophilic coating 23a proximally terminates so as not to cover the extreme proximal portion of polymer sleeve 22a. The non-hydrophilically coated proximal portion of polymer sleeve 22a may vary in length from 10.0 to 30.0 centimeters. The benefit of not coating the extreme proximal portion of wire guide 20 with the hydrophilic material is to facilitate better gripping and consequently greater control of wire guide 20 during its use.

While the invention has been illustrated and described in detail in the drawings and foregoing description the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention are desired to be protected.

Claims

1. A wire guide comprising:
an elongated central core having a proximal and distal portion, said central core further having a proximal and distal end;
a coil positioned substantially concentrically with said central core and secured to said distal portion

of said central core, said coil having a proximal and distal portion;

a polymer sleeve having a proximal and distal portion. said polymer sleeve enclosing said proximal portion of said central core; and,

a hydrophilic coating having a proximal and distal portion, said hydrophilic coating enclosing said polymer sleeve.

2. The wire guide of claim 1 wherein said polymer sleeve distally terminates at said proximal portion of said coil.

3. The wire guide of claim 2 wherein said hydrophilic coating distally terminates at said proximal portion of said coil.

4. A wire guide comprising:

an elongated central core having a proximal and distal portion, said central core further having a proximal and distal end;

a coil positioned substantially concentrically with said central core and secured to said distal portion of said central core, said coil having a proximal and distal portion;

a polymer sleeve having a proximal and distal portion, said polymer sleeve enclosing said proximal portion of said central core; and

a hydrophilic coating having a proximal and distal portion, said hydrophilic coating substantially enclosing said polymer sleeve and proximally terminating at a point distal relative to the proximal end of said polymer sleeve.

5. The wire guide of any preceding claim wherein said central core is made of a nickel titanium alloy.

6. The wire guide of any of claims 1 to 4 wnerein said coil is made of platinum.

7. The wire guide of any preceding claim wherein the diameter of said central core is very near the diameter of said wire guide.

8. The wire guide of any preceding claim wherein said proximal portion of said central core is uniform in diameter and said distal portion of said central core is tapered.

FIG. 1

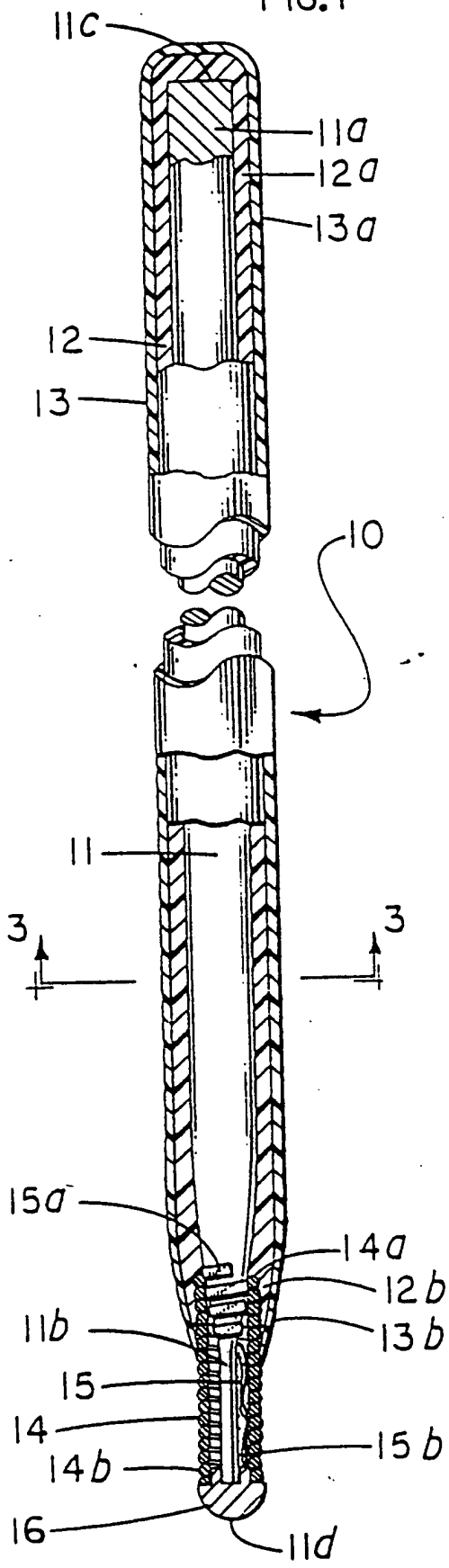
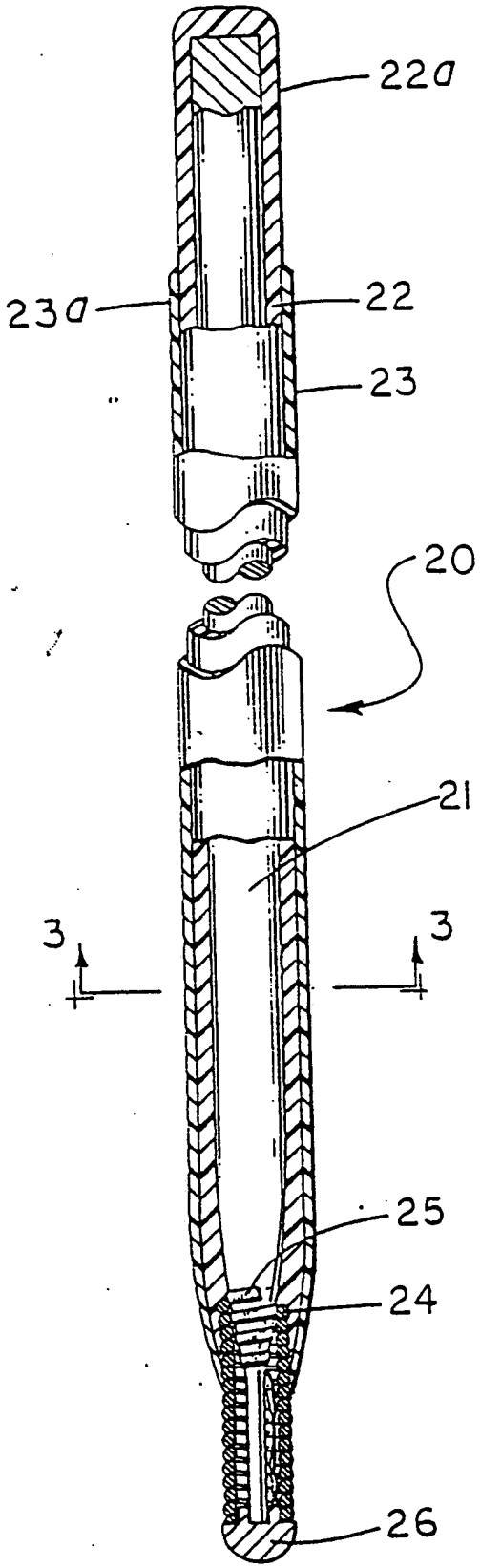

11c
11a
12a
13a
12
13
10
11
3
3
15a
14a
12b
11b
13b
15
14
15b
14b
16
11d

FIG. 2


22a
23a
22
23
20
21
3
3
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24
26

FIG. 3